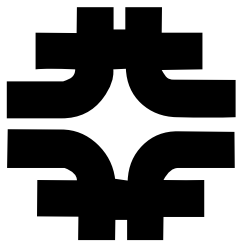
On Pbar Lifetimes at 150 Gev In the Tev, Emittance Study.



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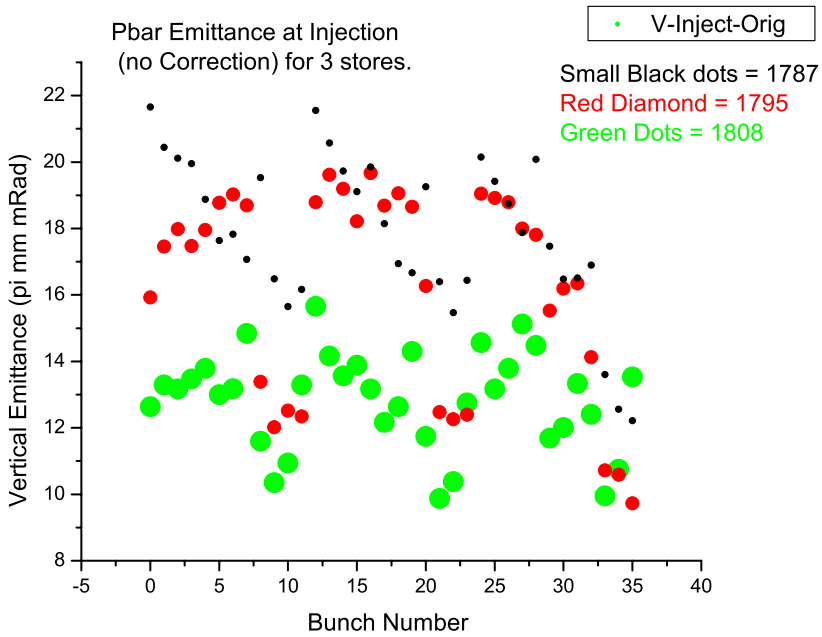
Oct-1-2 2002

The pbar lifetime is expected to be correlated with the Emittance at injection..

- We agree on the above statement! (M. C., V. S.,..)
- Do we have emittance measurement accurate enough ?
  - No TeV Long. Emittance at pre-cogging stage (It will be fixed. No time estimate though)
  - M.I. Long. Emittance First two transfers : erroneous data. Let us focus on the remaining 7 transfers.
  - TeV Flying wire: we have good SDA data, need calibration.
- Only 3 recent stores were recently analysed (my D44 Archiver Prototype failed this week-end, it needs professional attention!)

Transverse Emittance at Injection



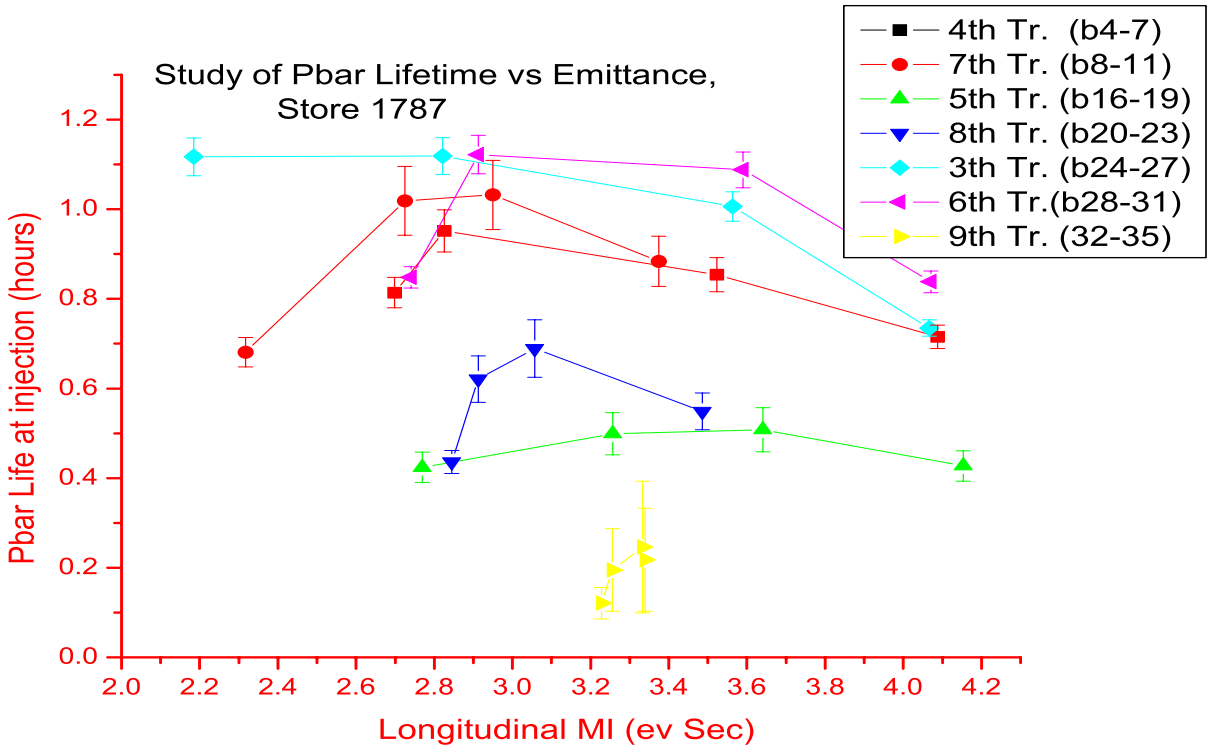
Large fluctuations from store to store.

Trend: the first bunch of every 4-bunch transfer has a higher emittance with respect to the next3 bunches.

There are exceptions (store 1795)

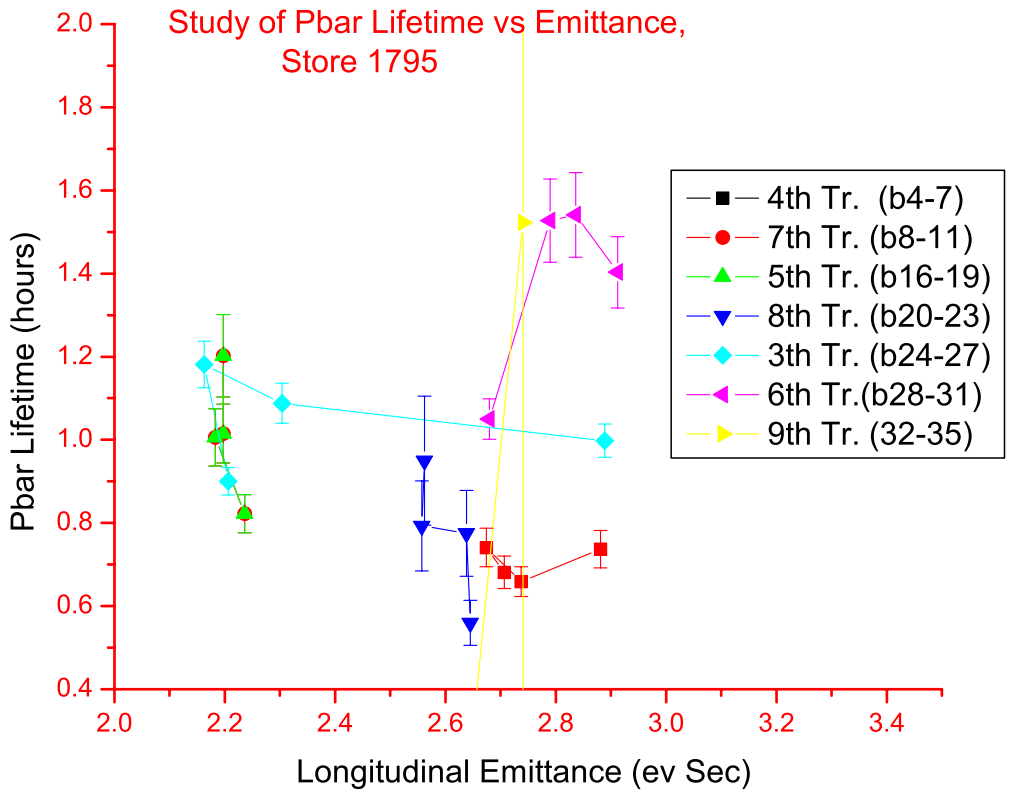
Explanation: one of the pbar kicker does not have a sufficient long plateau to accommodate the ~ 1.2 μsec transfer

Pbar Early Lifetime for these 3 stores, 1787

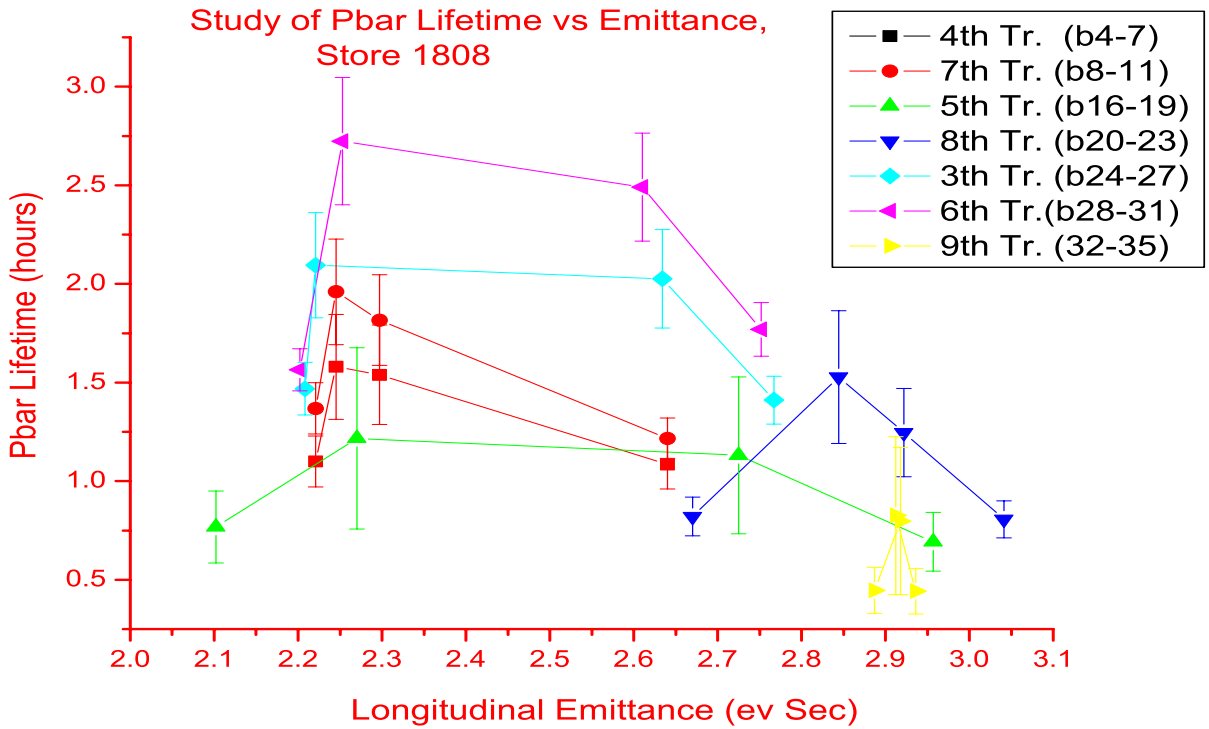


Measured during ~ 7 minutes , after injection, (except last transfer, for which there is no time

Pbar Early Lifetime, 1795



Pbar Early Lifetime 1808



Tentative conclusions:

All tentative: too little range in emittance with respect to measurement accuracy!
And too much variation store to store..
Yet, it seems, based on "good stores" 1787 and 1808 (which if we would not have hit "that" instability, would have produce lots of Luminosity), that:

- by comparing first vs last 3 bunch in the transfer, transverse emittance matters (vertical at least) (Large emittance, small lifetime)
- As the longitudinal emittance grow vs bunch number in a given transfer, the life time decreases => also expected.
- Comparing "good transfers", 3^{rd} and 6^{th} say, between store 1808 and store 1787, lifetime is also anticorrelated with long. Emittance.
- Bunch position also matters:

  See tentative ordering for 4^{th}, 7^{th}, 3^{rd}, 6^{th} transfers in store 1787, 1808.

  Note : bunch 9 should be ignored: we are measuring the lifetime over a very short period ($\sim<$ 1 min), as we accelerate immediately afterwards.

Missing Study : Dependency on Proton Intensity.

The average proton intensity were 205, 195 and 229, fro store 1787, 1795, 1808, respectively.
However, paradoxically, the lifetime for store 1808 were better than for store 1787, while the current was 10% higher.
May be not so surprising: the Horizontal damper was “on” for 1808, and was off for store 1787 (not fully commissioned yet)
We are changing a bit too many variable at once! But this is hard to avoid! More studies are needed…

Suggested Action list:

Take more data, parasitically (analyze more stores)
Improve FY accuracy/calibration.
Fix TeV SBD front-end software for pBar, so that we get longitudinal emittance measurement in the TeV, at any cogging states.
If need be, the suggested studies down below could be refined into a real plan..

1.36 on 4 store

- Do not cog after ~ 7 minutes. Confirm that the lifetime is not constant. Presumably, this is due to the "shaving" action of the long range beam-beam. (we might not have many pbar left..)

- The transverse emittance should then decrease.

2. 36 on 4 store: Cog at the right place right after injection. Measure lifetime and emittance, as above (3 or 4 fly, 10 min. apart.)
3. 36 on 4 store, Cog at different azimuthal positions..(if possible or relevant)
4. 0 on 4 (or 12), measure (and record raw data!) lifetime and emittance again (we probably improved the pbar emittance emttance via BLT tuning)